

## CLAIMS

1. A retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs formed of parallel V-shaped groove groups (x, x, x,..., y, y, y,..., and z, z, z,...) from three directions of x direction, y direction, and z direction and set on a common plane (S-S') decided by base line groups of the parallel V-shaped groove groups, characterized in that one-side groove angle (GLx, GRx, GLy, GRy, GLz, or GRz) formed between

a cross line between

a plane vertical to the common plane (S-S') and a V-groove vertical plane (Svx, Svy, or Svz) which includes the base line of a V-shaped groove and perpendicular to said the common plane (S-S'), and a reflective lateral face (a1, b1, c1, a2, b2, or c2),

and the V-groove vertical plane

does not form a constant angle in the reflective lateral face but the lateral face forms a curved and/or multiple surface.

2. The retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs according to claim 1, characterized in that in at least one reflective lateral face for constituting the triangular-pyramidal cube-corner retroreflective element pairs, the one-side groove angle (GLx, GRx, GLy, GRy, GRz, or GRz) does not form a constant angle with the maximum deviation of 0.0001 to 0.1° from a normal one-side groove angle for forming a cube corner and a reflective lateral face forms a curved and/or multiple surface.

3. A retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs formed of parallel V-shaped groove groups (x, x, x,..., y, y, y,..., and z, z, z,...) from three directions (x, y, and z directions) according to claim 1 or 2, characterized in that the internal angle of one of bottom-plane triangles formed of three bottom

planes constituting the reflective elements ranges between 35 and 75°.

4. The retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs formed of parallel V-shaped groove groups (x, x, x,..., y, y, y,..., and z, z, z,...) from three directions according to claim 3, characterized in that the internal angle of one of bottom-plane triangles formed of three base lines constituting the reflective elements ranges between 45 and 70°.

5. The retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs formed of parallel V-shaped groove groups (x, x, x,..., y, y, y,..., and z, z, z,...) from three directions (x, y, and z directions) according to any one of claims 1 to 4, characterized in that the depth of a plane ( $S_x$ ,  $S_y$ , or  $S_z$ ) formed by the base line group of at least one-directional V-shaped groove constituting the reflective elements is different from the depth of other planes.

6. The retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs formed of parallel V-shaped groove groups (x, x, x,..., y, y, y,..., and z, z, z,...) from three directions (x, y, and z directions) according to any one of claims 1 to 5, characterized in that an x-directional V-shaped groove constituting the reflective elements does not pass through the intersects (A and B) of y- and z-directional V-shaped grooves and is formed at a position having an offset ( $\Delta x$ ) from a straight line connecting intersects A and B, the triangular-pyramidal cube-corner retroreflective element pairs are asymmetric pairs.

7. A retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs formed of V-shaped groove groups (x, x, x,..., y, y, y,..., and z, z, z,...) arranged at equal intervals

from three directions and set on a common plane (S-S') decided by base line groups of the V-shaped groove groups, characterized in that the base line constituting any-directional V-shaped groove in the retroreflective element pairs is a nonlinear base line which does not form a linear trajectory and the reflective lateral face formed of the V-shaped groove forms a curved and/or multiple surface.

8. The retroreflective article according to claim 7, characterized in that a nonlinear factor ( $f_x$ ,  $f_y$ , or  $f_z$ ) specified by the maximum distance between the intersect of a vertical line from the both-end straight line connecting both ends of the nonlinear base line to the nonlinear base line and the nonlinear side and the both-end straight line ranges between  $0.0001L$  and  $0.05L$  when assuming the length of the both-end straight line as  $L$ .

9. The retroreflective article according to claim 7 or 8, characterized in that the trajectory of the nonlinear base line includes at least one curved line selected from a function obtained from a circular arc, trigonometric function (sine curve, cosine curve, or tangent curve), inverse trigonometric function, elliptic function, hyperbolic function, and function obtained by combining the functions.

10. The retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs according to claim 7 or 8, characterized in that the trajectory of the nonlinear base line is shown by a broken line obtained by combining straight lines.

11. The retroreflective article formed of many triangular-pyramidal cube-corner retroreflective element pairs according to any one of claims 7 to 10, characterized in that a one-side groove angle ( $GL_x$ ,  $GR_x$ ,  $GL_y$ ,  $GR_y$ ,  $GL_z$ , or  $GR_z$ ) formed of a line decided when a plane vertically intersecting with the both-end

straight line intersects with the reflective lateral face and a V-groove vertical plane ( $U_x$ ,  $U_y$ , or  $U_z$ ) vertical to a common plane ( $S$ - $S'$ ) and including the both-end straight line do not form a constant angle with the maximum deviation of  $0.0001$  to  $0.1^\circ$  from a normal one-side groove angle for forming a cube corner or a reflective lateral face does not form a plane.

12. The retroreflective article according to any one of claims 7 to 11, characterized in that an internal angle of a base line triangle formed of the both-end straight line connecting both ends of base lines of three reflective lateral faces constituting the reflection elements ranges between  $35$  and  $75^\circ$ .

13. The retroreflective article according to claim 12, characterized in that an internal angle of a base line triangle formed of the both-end straight line connecting both ends of base lines of three reflective lateral faces constituting the reflection elements ranges between  $45$  and  $70^\circ$ .

14. The retroreflective article according to any one of claims 7 to 13, characterized in that the depth of at least one of planes ( $S_x$ ,  $S_y$ , or  $S_z$ ) formed of each base line group of the three-directional V-shaped groove groups ( $x$ ,  $x$ ,  $x$ ,...,  $y$ ,  $y$ ,  $y$ ,..., and  $z$ ,  $z$ ,  $z$ ,...) is different from the depth of other planes.

15. The retroreflective article according to any one of claims 7 to 13, characterized in that an x-directional V-shaped groove does not pass through the intersect (A or B) between y-directional and z-directional V-shaped grooves and is formed at a position having an offset ( $\Delta x$ ) shown by the maximum distance between the x-directional groove and a straight line connecting the intersects A and B, and the triangular-pyramidal cube-corner retroreflective element pair is an asymmetric pair.